The Effect of a Structured Smoking Cessation Program, Independent of Exposure to Existing Interventions

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ABSTRACT

Objectives. This study assessed the effectiveness of a smoking cessation program for women in public health clinics, controlling for reported exposures to 4 common intervention components (provider advice, booklet, video segment, posters) among smokers in the control group.

Methods. After a baseline control period, 10 pair-matched clinics were randomly assigned to study groups. A total of 1042 smokers in the combined baseline and control groups and 454 smokers in the intervention group completed a preintervention questionnaire and a postintervention telephone interview 5 to 8 weeks later. Eight smoking outcomes, including quitting, were analyzed for the effect of reported exposure to intervention components, experimental program, and clinic service.

Results. Greater exposure to intervention components, being in the experimental program, and being seen in prenatal clinics independently improved smoking outcomes.

Conclusions. The number of interventions reported by smokers in the control group ranged from none to 4 and varied across clinic services. The experimental program we tested produced better outcomes than the minimal smoking cessation interventions already existing in the control clinics, after we controlled for whether smokers were or were not exposed to these interventions. (*Am J. Public Health*. 2000;90:751–756)

In this report we discuss findings from the evaluation of a smoking cessation program offered in public health clinics[1] in light of the varied degree of implementation of existing interventions in the control group. This issue is important because the study was conducted in a public health practice context (i.e., where both experimental and usual and customary interventions were to be initiated and delivered to patients by clinic personnel as part of routine medical visits).[2] Under these conditions, implementation of interventions is likely to be a variable rather than a given. While the structure of the experimental program allowed for the selection of smokers to whom the program was at least offered, no such selection was feasible in the control condition. The difference in outcomes between the experimental and control groups could then be affected not only by the intrinsic efficacy of the new interventions when compared with existing interventions, but also by the degree to which the latter were delivered to patients.

Several controlled studies have established the effectiveness of minimal smoking cessation interventions in prenatal clinics[2–13] and other health care delivery settings.[14–18] Efforts are now being advocated to promote the use and assess the effectiveness of such interventions in public health practice. To promote widespread use, minimal interventions have been recommended that can be easily incorporated into ongoing health care delivery systems and consistently implemented with most patients.[19–21] However, minimal interventions—such as brief advice to quit from the physician, the setting of a quit date, or the provision of self-help materials—have been recommended to health care professionals for years.[22–24] Thus, they are likely to be applied to some extent in most public health clinics. At the same time, a large body of empirical evidence suggests that implementation by health care professionals has been inconsistent; only a portion of patients who smoke receive these interventions, and that proportion varies by type of patient, medical visit, provider, and health care setting.[25–29] Control groups in public health practice studies are likely to reflect these conditions.

Most trials of smoking cessation interventions have not considered degree of intervention implementation in the control group.[2] In 4 such studies, research staff gave control patients a standardized message and/or pamphlet, or nothing.[7–9,14] Other studies have defined the control condition as whatever was "usual and customary."[6–10,12,13,16] Two of these studies assessed patient-reported exposure to physicians' advice to quit. Exposure varied between 56% and 61% across 3 study groups in 1 study[14] and was 34% in the control group in the other study.[12] Neither study reported smoking cessation outcomes that controlled for exposure.

A recent review of smoking cessation intervention studies in prenatal services[2] found only 1 study that was conducted in public health practice. That study, which assessed exposure to interventions through postvisit interviews with a subsample of subjects, found it to be high in both the experimental and control group.[30] The authors speculated that this finding, as well as the potential similarity of the minimal interventions across study groups, might have contributed

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to the lack of significant outcomes in their study.[30]

In studies aimed at improving provider performance, the percentage of patients reporting provider advice to quit smoking ranged from 22% to over 50% in control groups and from 40% to 85% in intervention groups.[31–34] While most of these studies also looked at patient smoking cessation as an outcome, they did not report this outcome controlling for exposure to interventions.

We analyze the results of the evaluation of an experimental smoking cessation program in prenatal, family planning, and well-child clinics that, overall, produced better smoking cessation outcomes than those observed in the control group.[1] Our previous analysis showed substantial exposure to 4 basic intervention components (provider advice, booklet, posters, a video) in the study control group, with large variation in exposure across clinic services.[35] Smoking outcomes among control subjects were a positive function of level of exposure to these basic intervention components.[35] In this report, we address 2 questions: (1) Do the overall better outcomes for the experimental program remain when smokers' levels of exposure to basic intervention components in both study groups are controlled for? (2) Did the provider letter and motivational telephone call, which were offered as adjunct intervention components in the experimental program only, contribute to the better outcomes of the experimental group?

Background

Existing Interventions

Attempts to assess existing interventions included a clinic staff survey and in-depth interviews with key clinic personnel. All clinics had policies that prohibited smoking on the premises, required recording smoking status in the patient's medical chart, and recommended patient education about lifestyle health risks, including smoking. However, policy implementation was generally left to the individual provider's initiative. Most informants reported that, whenever possible, they counseled patients to quit smoking, but they also felt that some providers seldom counseled and that many did so inconsistently. Existing smoking cessation brochures or other materials were not well recognized by clinic personnel. Medical charts included little or no documentation regarding smoking cessation interventions.

In summary, the above information indicated that smoking control policy existed and interventions occurred in all the study clinics, but the information was not sufficiently specific to define the nature or the prevalence of the interventions or to categorize the clinics on this variable. A baseline study phase was therefore conducted to assess existing interventions and their effectiveness through patient interviews, as described below.

Experimental Smoking Cessation Program

The experimental program was designed to improve motivation and readiness to quit smoking and increase the likelihood of quitting among women of childbearing age. Consistent with current guidelines,[19] the program included interventions to be delivered to smokers during the medical visit, adjunct interventions after the visit, and a chart reminder system to be implemented by clinic support staff to facilitate implementation by providers. Passive intervention components included posters and an educational television segment shown in the clinic waiting rooms. During routine medical visits, primary health care providers (physicians, nurse practitioners, or other nurses) delivered brief advice to quit, a written agreement, signed by both the patient and the provider, to set a quit date or take other actions toward quitting, and a take-home motivational self-help booklet. Two adjunct interventions were implemented by research staff after the visit. They were a reminder letter from the provider and a 15-minute telephone call, based on motivational interviewing techniques,[36] to smokers who agreed to it on the patient–provider agreement form.

Methods

Study Design

We evaluated the program in 33 prenatal, family planning, and pediatric services within 12 public health clinics located in Chicago and 2 suburbs. The evaluation used a matched-pair random assignment design, with randomization to study group within pairs of clinics, and before- and after-visit smoker measurements. Clinics were matched on size, type (health department, university attached, freestanding), location (city, suburb), and racial mix of the clientele. Ideally, clinics should have been matched on their existing smoking cessation interventions. However, as previously described, attempts to define such interventions were unsatisfactory. Moreover, we expected that whatever the nature of the existing interventions, their level of implementation would differ across clinics and services. With only 6 pairs of clinics, we could not rely on randomization alone to ensure equivalence on this unknown variable across study groups. Therefore, the study included a baseline period to assess study outcomes and patient-reported exposure to smoking cessation interventions in all study clinics and to establish the comparability of experimental and control clinics in the approximately 10 months before the experimental program's implementation.

Case Accrual and Data Collection

We collected data from unduplicated smokers by using the same before- and after-visit strategies and instruments during both the baseline and experimental periods and in both the control and intervention clinics. Research personnel stationed in the clinic waiting rooms on rotating week-days identified smokers and collected a brief previsit self-administered questionnaire and the study consent form. To assess the program's effectiveness on smokers who were at least offered it, we included in the intervention group only smokers with documentation that the provider had given advice to quit (either a copy of the patient–provider agreement form or a clear entry in the medical chart) and a self-help booklet. Postintervention telephone interviews were conducted 5 to 8 weeks later by professional interviewers from the Survey Research Laboratory of the University of Illinois who had no connection with the clinics.

We report data from 10 of the 12 initial clinics. The 2 suburban clinics could not be included in the study hierarchical analysis because they did not have all 3 services. During the baseline period, we identified 1350 smokers in the 10 clinics; 1075 (80%) completed the previsit questionnaire and consent form, and of these, 580 (54%) completed the postvisit telephone interview. During the experimental period, we identified 911 smokers in the control clinics; 784 (86%) completed the previsit questionnaire and consent form, and of these, 462 (59%) completed the postvisit telephone interview. In the intervention clinics, we identified 1349 smokers; 1025 (76%) completed the questionnaire and consent form, and of these, 731 (71%) had at least the documented provider advice. Of these patients, 454 (62%) consequently completed the postvisit interview.

The large attrition at the postintervention interview was due primarily to inability to reach the respondents by telephone. To assess possible bias due to attrition, we compared patients who completed postvisit interviews with patients lost to attrition on race, service, level of addiction (cigarettes smoked per day and years smoked), and scores on previsit smoking-related scales (action to-

ward quitting, stage of readiness, motivation, and confidence).[1] Separate comparisons were conducted within the entire baseline panel, within the control clinics in the experimental panel, and within the intervention clinics in the experimental panel.[1] Patients in the study and those lost to attrition did not differ by race, cigarettes smoked per day, stage of readiness, motivation, or confidence. In the experimental intervention panel only, attrition varied by service, with greater attrition in prenatal services and less attrition in well-child services. In the experimental control panel only, study patients had engaged in more actions toward quitting than those lost to attrition. In each panel, study patients had smoked longer than those who dropped out. Given these patterns, we conclude that attrition did not bias study findings.

The main purpose of this study was to compare outcomes associated with exposure to the experimental program with outcomes associated with exposure to "usual and customary" interventions in these clinics. Both the baseline and control groups reflected usual and customary conditions in the clinics. The baseline and control groups were similar in pre- and postvisit study outcomes[1] and in reported exposure to intervention components (data not shown). Therefore, we combined cases from the baseline and the experimental control groups, for a total of 1042 control cases.

Measurements

Study outcomes, measured in the postintervention interviews, included 4 reported actions toward quitting and 4 scales. Actions toward quitting, all coded no (0) or yes (1), were cutting down on the number of cigarettes, trying to quit, quitting for at least 24 hours, and quitting. *Action* was a 5-point scale reflecting the sum of the first 3 actions taken (0 to 3) or having quit (4). *Readiness to quit,* an extension by Crittenden and colleagues[37] of Prochaska and DiClemente's stage measure,[38,39] had the following categories: (1) planning no change in smoking, (2) seriously thinking of cutting down but not quitting, (3) seriously thinking of quitting but not within the next 6 months, (4) contemplating quitting within the next 6 months, (5) preparing for quitting, and (6) action (quitting). *Motivation to quit* was the sum of three 4-point items reflecting desire to quit, desire to cut down, and determination to cut down. *Confidence* was the sum of two 4-point items reflecting confidence in one's ability to quit or to cut down. These scales have adequate reliability and validity.[37,40,41]

The independent variables were *study condition* (baseline and control vs experimental) and *exposure to smoking cessation intervention components* (assessed in the postintervention interviews). The *clinic service* where the women had their medical visits (prenatal, family planning, well-child) was a control variable, because of variation across the services in the prevalence of smoking interventions offered in normal practice[35] and in pre- and postvisit smoking outcomes.[1,35] Women in all study groups were asked whether, during their clinic visit, (1) they saw posters about quitting smoking, (2) they saw a video about quitting smoking, (3) the physician or nurse talked to them about quitting smoking, and (4) they were given a booklet about quitting smoking (all yes/no questions). A measure of level of exposure to basic intervention components was a count of these 4 items (0–4). We also asked respondents if they had (1) received a letter from their provider about quitting smoking and (2) received a telephone call from a counselor about quitting smoking. Exposure to each of these adjunct interventions was measured with a dummy variable.

Hypotheses and Data Analysis

We explored the contribution of exposure to intervention components to smoking cessation outcomes in both study groups. Specifically, we tested the following hypotheses. *Hypothesis 1:* The intervention program will be associated with better smoking cessation outcomes than the control condition, even when level of exposure to the basic intervention components is controlled for. *Hypothesis 2:* Receiving the provider reminder letter and motivational telephone call will be associated with significant improvement in outcomes, when level of exposure to the basic intervention components is controlled for.

To test these hypotheses, we used hierarchical regression (for continuous scales) and hierarchical logistic regression (for the 4 individual actions) to adjust for possible clustering within clinics. The first model, or Model 1, which tested Hypothesis 1, included as predictors clinic service, represented by dummy variables for family planning and well-child (with prenatal treated as the reference group); study group (with control as the reference group); and level of exposure to basic intervention components. Clinic service was included because of its known impact on exposure to interventions.[35] The second model, or Model 2, which tested Hypothesis 2, predicted each outcome on the basis of clinic service, level of exposure to basic interventions, and separate reported exposure terms for the provider letter and the motivational interview. In this latter model, we omitted study condition from the model because of its extreme multicollinearity with other predictors.

Results

Table 1 summarizes exposure to interventions and smoking outcomes by study group (every $P<.05$ except for "confidence"; 2-tailed). The experimental group's greater

TABLE 1—Reported Exposure to Intervention Components and Smoking Outcomes, by Study Condition

	Baseline/Control (n = 1042)	Experiment (n = 454)
Exposure to basic intervention components		
Poster, %	55.1	83.3
TV segment, %	21.0	35.0
Advice, %	33.4	83.5
Booklet, %	28.5	93.0
Mean exposure level (SD) (range = 0–4)	1.37 (1.21)	2.94 (0.91)
Adjunct components		
Letter, %	3.1	58.8
Motivational call, %	1.6	67.8
Smoking outcomes		
Cut down, %	59.2	76.4
Tried to quit, %	38.5	58.6
Quit 24 h, %	27.6	43.6
Quit, %	6.7	14.5
Actions, mean (SD) (range = 0–4)	1.32 (1.28)	1.93 (1.34)
Stage, mean (SD) (range = 1–6)	3.64 (1.21)	4.07 (1.19)
Motivation, mean (SD) (range = 3–12)	9.70 (2.67)	10.46 (2.21)
Confidence, mean (SD) (range = 1–8)	5.58 (1.88)	5.83 (1.81)[a]

[a] *P* value is not significant at .05 level.

exposure to the basic intervention components is not surprising, given the study accrual criteria of documented exposure to provider advice and booklet. Exposures to the letter and motivational call were reported almost exclusively by women in the experimental condition. The experimental group's better smoking outcomes reflect the results of the overall program evaluation, which were reported elsewhere.[1]

Tables 2 and 3 summarize the regression of study outcomes (actions and scale means, respectively) with level of exposure to basic intervention components, study condition (in Model 1 only), and service. The second-level factor, clinic, was not a significant source of variation in any of these random-intercept models. The Model 1 data show a significant positive effect of level of exposure to basic intervention components ($P < .05$, 1-tailed) on all smoking outcomes except quitting. In support of Hypothesis 1, the experimental condition further enhanced all 4 actions toward quitting, the action scale, stage of readiness, and motivation. However, study condition was not related to confidence when level of exposure to basic intervention components was controlled for.

The second study hypothesis was that the adjunct components would further enhance outcomes, after level of exposure to the basic intervention components was controlled for. In Model 2, which controlled for level of exposure to basic components, reported exposure to the provider letter did not influence any study outcomes. Although research staff mailed the letter to all women in the experimental condition group, only a slight majority of them recalled receiving it (see Table 1). Furthermore, when it was noticed by the women, the letter had no effect on smoking outcomes (Tables 2 and 3). Thus, Hypothesis 2 is not supported with respect to the contribution of the provider letter to smoking outcomes. Greater support for this hypothesis comes from evidence of the efficacy of the motivational call. The call did not influence the likelihood of cutting down, trying to quit, or quitting for 24 hours, but it enhanced the likelihood of quitting (odds ratio = 3.071) and had a favorable effect on overall action, stage of readiness, motivation, and confidence scores. Considering that in Model 1 the experimental study condition was associated with improvement in all outcomes except confidence after level of exposure to basic interventions was accounted for, the motivational

TABLE 2—Logistic Regression of Actions Toward Quitting on Service and Exposure to Intervention Components (n = 1496)

	Cut Down		Try to Quit		Quit for 24 h		Quit	
	b (SE)	OR	b (SE)	OR	b (SE)	OR	b (SE)	OR
Model 1[a]								
Intercept	.336*** (.125)	1.399	−.415** (.176)	0.660	−.191*** (.217)	0.826	−2.404*** (.323)	0.090
Family planning	−.381 (.225)	0.683	−.490* (.263)	0.612	−.198 (.221)	0.820	−.055 (.601)	0.946
Well-child	−.366 (.237)	0.693	−.598** (.253)	0.549	−.406** (.163)	0.666	−.692 (.477)	0.500
Study condition	.455** (.192)	1.576	.449* (.254)	1.566	.295* (.170)	1.343	.736*** (.283)	2.088
Exposure level	.243*** (.055)	1.275	.264** (.129)	1.302	.307*** (.078)	1.359	.047 (.108)	1.048
Model 2[a]								
Intercept	.342*** (.119)	1.408	−.424*** (.164)	0.654	−1.192*** (.230)	0.304	−2.401*** (.391)	0.091
Family planning	−.383 (.391)	0.681	−.486* (.287)	0.614	.183 (.220)	0.832	−.050 (.744)	0.951
Well-child	−.374 (.276)	0.687	−.604*** (.225)	0.546	−.409** (.206)	0.663	−.704 (.462)	0.494
Exposure level	.233*** (.083)	1.263	.301 (.237)	1.351	.328*** (.099)	1.388	.049 (.158)	1.050
Letter	.017 (.386)	1.039	−.218 (.382)	0.803	−.319 (.690)	0.276	−.262 (.805)	0.769
Motivational call	.745 (.481)	2.106	.609 (.398)	1.839	.498 (.467)	1.646	1.122* (.595)	3.071

Note. b = unstandardized regression coefficient; SE = standard error; OR = odds ratio.
[a]Random intercept model with clinic as a second-level factor.
*$P < .10$; **$P < .05$; ***$P < .01$; all nondirectional.

TABLE 3—Regression of Smoking Outcome Scales on Service and Exposure to Intervention Components (n = 1496)

	Action, b (SE)	Stage, b (SE)	Motivation, b (SE)	Confidence, b (SE)
Model 1[a]				
Intercept	1.298*** (.098)	3.593*** (.092)	9.556*** (.182)	5.600*** (.146)
Family planning	−.231** (.093)	−.119 (.089)	−.207 (.183)	−.042 (.135)
Well-child	−.353*** (.086)	−.232*** (.083)	−.311* (.172)	−.280** (.127)
Study condition	.358*** (.094)	.187** (.089)	.294* (.175)	.128 (.139)
Exposure level	.181*** (.029)	.048*** (.028)	.272*** (.058)	.083* (.043)
Model 2[a]				
Intercept	1.302*** (.096)	3.593*** (.092)	9.556*** (.183)	5.601*** (.147)
Family planning	−.224** (.092)	−.119 (.088)	−.202 (.183)	−.050 (.135)
Well-child	−.353*** (.086)	−.231*** (.082)	−.309* (.171)	−.286** (.126)
Exposure level	.190*** (.028)	.142*** (.027)	.275*** (.056)	.065 (.042)
Letter	−.134 (.098)	−.004 (.095)	.053 (.194)	.058 (.144)
Motivational call	.024*** (.097)	.318*** (.094)	.325* (.192)	.298** (.143)

Note. b = unstandardized regression coefficient; SE = standard error.
[a]Random intercept model with clinic as a second-level factor.
*$P < .10$; **$P < .05$; ***$P < .01$; all nondirectional.

call appears to be a useful adjunct that complements the basic interventions.

Discussion

As expected, and shown in this study, some elements of what is considered minimal smoking cessation intervention are by now present in most public health clinics, but the consistency of implementation varies greatly. When implemented, these existing minimal interventions can have significant effects on smoking cessation outcomes. This has important implications for evaluation methods in public health practice research. If implementation of existing interventions in the control group is a variable that can significantly affect evaluation outcomes, it should be explicitly included in the study design.

There are several possible limitations to our study. Patient-reported exposure to interventions may be subject to recall error. Error is evident in the experimental group, in which all smokers had documented exposure to the provider advice and booklet but only 84% and 93%, respectively, reported these items (Table 1). Accuracy of recall in both study groups might have been affected by patient inattention or forgetting. Alternatively, some provider advice might have been so minimal as to be easily forgotten by the patient. Low exposure to the video segment was partly explained by known poor implementation of this component in the clinics. If the available measurements are only approximate measures of actual exposure to intervention, they are likely to bias the study in the direction of more conservative estimates of the effects of intervention components on study outcomes. More refined measurements of actual interventions would probably strengthen rather than reduce these effects.

Our smoking outcomes were based on self-reports only. For several reasons, self-report data on smoking outcomes are appropriate in our study. (1) We found similar effects of exposure to intervention components across multiple outcomes, only 2 of which (abstinence and cutting down) can be biochemically validated. (2) Biochemical measures are expensive, intrusive, and difficult to implement in conjunction with follow-up telephone interviews, which were used to separate the study's intervention and evaluation components. (3) Rates of false reports of abstinence have been found to be quite low in impersonal telephone interviews, such as those used in our study, with minimal pressure to give desirable answers.[42] (4) There is no reason to believe that any bias in self-reports would differ for smokers who had been exposed and those who had not been exposed to intervention components in the clinic 5 to 8 weeks earlier.

Overall, our findings support the current recommendation for minimal smoking cessation interventions for women seen in public health clinics. Even the minimal interventions that were occurring in the control condition were associated with better smoking cessation outcomes than no intervention at all. A higher level of exposure to basic intervention components was associated with small but consistent benefits, even when study condition was controlled for.

However, these outcomes can be further improved with a more structured, multicomponent program. The experimental intervention significantly added to these benefits. The motivational call, offered as an adjunct to the clinic-based interventions, provided complementary added value, particularly in enhancing the quit rate. Improving the benefits of minimal intervention components already in place requires a more elaborate intervention, with strong patient counseling strategies and well-conceived educational materials. □

Contributors

C. Manfredi and K. S. Crittenden planned the intervention program, conceptualized the study, developed the data collection instruments, and cowrote the paper. K. S. Crittenden and Y. I. Cho planned and conducted the data analysis. C. Manfredi and J. Engler conducted the initial qualitative clinic assessments. J. Engler supervised the clinic-based data collection. R. Warnecke conceptualized the program project that included this study and contributed to the study design and planning.

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Protection procedures for human subjects were approved by the Institutional Review Boards of the University of Illinois at Chicago and 2 other agencies accounting for 7 of the study clinics. Inclusion in the study required a signed patient consent form at the time of accrual.

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